California Environmental Protection Agency
AIR RESOURCES BOARD
Monitoring and Laboratory Division

GDF Curb Pump Hose Emissions Study

I. Introduction

The California Air Resources Board (ARB) proposes to conduct a study to measure evaporative emissions from gasoline dispenser facility (GDF) curb pump hoses. The purpose of this study is to determine the evaporative emission factors from existing vapor recovery hoses and subsequently the statewide emissions to evaluate the necessity for emission control measures.

II. Plan Overview

ARB staff will conduct in-house gravimetric testing of new and in-use vapor recovery GDF hoses under non-controlled ambient conditions. New GDF hoses will be obtained through distributors or solicited from hose manufacturers. In-use hoses will be acquired from the GDFs with assistance of the hose manufacturer, maintenance contractor, or GDF owner. Upon removal of the hose from the GDF pump, ARB staff will immediately fill the hose with commercial pump fuel and cap both ends to ensure the hose remains wetted as it awaits testing. ARB staff will select hoses that have been in use for at least 1 year at the GDF. The purpose of testing new and in-use hoses is to determine the average emission factor of hoses over their useful life. Three different types of vapor recovery hoses will be tested:

- Balance;
- Balance with liquid removal device; and
- Vacuum assist.

Common models of balance and vacuum assist hoses will be selected for evaporative emissions testing. A trip blank of each model and type of hose will also be tested. Staff anticipates testing approximately 18 hoses throughout the test period.

III. Test Procedure

ARB staff proposes to conduct evaporative emissions testing using a gravimetric test procedure (Attachment).

IV. Timeline

ARB staff intends to test GDF curb pump hoses from August through October of 2004.

V. Report

At the completion of testing, ARB staff will prepare a report summarizing the findings. The anticipated completion date for the report is October 2004.

VI. Contacts

The following ARB staff will be the contacts for this study:

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ATTACHMENT

GDF Curb Pump Hose Emissions Test Procedure

1 Purpose

The purpose of this test procedure is to measure the diurnal evaporative emissions from vapor recovery hoses used at California gasoline dispensing facilities. Evaporative emissions include emissions penetrating through the hose walls (permeation) and emissions escaping through the hose end swivel joints and hose end connections (fugitives).

Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

2 Principle and Summary of the Test Procedure

The evaporative emissions rate is determined gravimetrically by measuring the daily weight loss of gasoline in the hose. Prior to weighing, the hose is filled to approximately 75% capacity with commercial pump fuel, capped at both ends, and subjected to 24-hour diurnal temperature cycles under ambient conditions. For each 24-hour diurnal cycle, the hose is weighed to determine the daily weight loss. The evaporative emissions rate is then determined from averaging the daily weight loss from the last three consecutive days of testing.

3 Bias and Interference

3.1 To accurately quantify the evaporative losses attributable solely to permeation and fugitives from the swivel connector, each hose tested must be completely sealed. Hoses incorrectly sealed will emit additional evaporative emissions, which can affect the final weight loss calculations.

3.2 Relative humidity can bias evaporative emission results. An empty hose (trip blank) is weighed daily to compensate for bias caused by humidity.

3.3 Differences in commercial pump fuels may bias permeation results. ARB will analyze the commercial pump fuel used for testing.

4 Sensitivity and Range

4.1 The range of mass measurement of a filled hose assembly wrapped on a weigh stand is approximately 5,000-7,500 grams. A balance scale is required capable of measuring this weight with readability of 0.1 gram and repeatability of ±0.05 gram.

4.2 A temperature instrument capable of measuring ambient temperatures within ± 2ºF.

4.3 A barometric pressure instrument capable of measuring ambient pressure within 0.06 inches of mercury.

5 Equipment

5.1 A top loading balance as described in paragraph 4.

5.2 A hose assembly weigh stand to contain the hose assembly on the balance table.

5.3 A fueling station to safely store fuel and fill hose assemblies with gasoline.

5.4 A fuel draining station to safely drain and store fuel removed from hose assemblies.

5.5 A thermometer or temperature measuring device to continuously monitor the ambient temperature of the hose storage area.

5.6 A barometric transducer to continuously monitor the barometric pressure of the hose storage area.

5.7 A hose assembly holding rack to hang the hose.

6 Calibration Procedure

All instruments and equipment used for measurement shall be calibrated before use per the manufacturers' specifications.

7 Pre-Test Preparation

7.1 Record hose information in the *GDF Curb Hose Gasoline Vapor Emissions Form,* Figure 1.

7.2 Engrave a control number on the nozzle-end wrench nut. The control number is assigned by ARB staff and is found on the hose tag that was installed by ARB staff at the time the hose was removed from the station or in the case of new hoses, received from the distributor or hose manufacturer.

7.3 Set-up a datalogger to record ambient temperature and barometric pressure throughout the hose testing period.

8 Test Procedure

8.1 Cap one end of the vapor recovery hose with a Plugged Wayne Dispenser Coaxial Hose Splitter Manifold (part number A-47176). A Catlow Coaxial Hose Inverter (part number 200BI) is added when a vacuum assisted hose is tested. Fill hose to approximately 75% capacity with commercial pump fuel. Immediately cap the other end of the hose using another splitter and inverter (if needed) as described above. Record the volume of gasoline added to the hose.

8.2 Cap both ends of the trip blank hose using the manifold and inverter (if needed) as specified in Step 8.1.

8.3 Hang the hose and trip blank on the holding rack over night. During the peak ambient temperatures of the following day, submerse the hose in water to ensure there are no leaks from the caps. Wipe hose or use shop air to remove excess water from external hose surfaces, connectors, and caps and re-hang on the holding rack. Allow at least 12 hours to ensure that any excess water has evaporated.

8.4 Weigh each hose, with the weigh stand, to the nearest 1/10 gram and record the initial weight $\mathbf{W_{hi}}$ and $\mathbf{W_{ti}}$ along with the date and time on the *GDF Curb Hose Gasoline Vapor Emissions Form* (Figure 1). Re-hang each hose on the holding rack.

8.5 Conduct daily weighings at 24-hour intervals (± 30 minutes) for a minimum of 21 days. Record the weight $\mathbf{W_{hf}}$ and $\mathbf{W_{tf}}$ along with the date and time on the *GDF Curb Hose Gasoline Vapor Emissions Form* (Figure 1).

8.6 At the end of the testing period, download temperature and ambient pressure data from the datalogger to a storage device and maintain this information with the *GDF Curb Hose Gasoline Vapor Emissions Form* (Figure 1).

9 Calculating Emissions

9.1 The daily weight loss in grams is calculated for each 24-hour cycle as follows:

$$W_L = W_{hi} - [W_{hf} + (W_{ti} - W_{tf})]$$

Where:

W_L = The weight loss in grams.
W_{hi} = The initial weight of the fuel filled hose assembly in grams.

W_{hf} = The final weight of the fuel filled hose assembly in grams.
W_{ti} = The initial weight of the trip blank hose assembly in grams.
W_{tf} = The final weight of the trip blank hose assembly in grams.

9.2 The average weight loss over the last 3 consecutive days of the test period is as follows:

$$W_A = (W_{L1} + W_{L2} + W_{L3}) / 3$$

Where:

W_A = Average weight loss in grams.
W_{L1} = Weight loss in grams for the first 24-hour test period.
W_{L2} = Weight loss in grams for the second 24-hour test period.
W_{L3} = Weight loss in grams for the third 24-hour test period.

Figure 1

GDF Curb Hose Gasoline Vapor Emissions Form

Historical Documentation						Control Number:		
Manufacturer's Name						Preconditioning		
Manufacturer's Part Number						Date	Time	Weight
Type of Hose Assembly	Balanced		Vacuum					
Special Features	Venturi		Other:					
Acquired Source (Name)								
Address								
Phone								
Dispenser Location or Number								
Gasoline Manufacturer's Name								
Gasoline Grades Pumped in Hose								
Hose Installation Date								
Installers Name								
Company								
Phone								
Date Hose was Removed			Age					
Removers Name								
Company								
Phone								
Length of Hose in Inches								
Liquid Line Volume in ccm								
Hose Outside Diameter in Inches								

Notes:

Test Data				
Initial Weigh-in **(W_{hi})**				Notes:
Date	Time	Weight in gms (W_{hi})		
First 24-Hour Weigh-in **(W_{hf1*})**				
Date	Time	Weight in gms (W_{hf1})	Loss(W_{L1})	
Second Weigh-in **(W_{hf2*})**				
Date	Time	Weight in gms (W_{hf2})	Loss(W_{L2})	
Third Weigh-in **(W_{hf3*})**				
Date	Time	Weight in gms (W_{hf3})	Loss(W_{L3})	*(**$W_{hf\#}$**) = final weight of the capped fueled hose on the stand each successive day.

The average daily gasoline emissions rate in grams/day over three days **(W_A) = (W_{L1} +W_{L2}+ W_{L3})/3** :